AMRAD NEWSLETTER

Amateur Radio Research and Development Corporation October 1980

ERIC SCACE, K3NA WILL SPEAK at our October 6 meeting on the subject of Packet radio Protocols. The meeting will begin at 7:30 p.m. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, Virginia. Visitors and guests are welcome.

THE TIDEWATER HAMFEST-FLEA MARKET-COMPUTER SHOW will be on October 4 and 5 at the Virginia Beach Arts & Conference Center. Take Hwy 64 to Hwy 44 which passes by the door.

THE SPREAD SPECTRUM SIG had its second meeting on September 7. Attending were: KAØESA, WB3KDU, K4KJ, W4RI and WA3ZXW. The purpose of the meeting was to try to determine who could do what in terms of experimental spread spectrum (SS) systems so that we could nail down what to ask for in the STA request. If you're reading this and don't have the foggiest idea of what it's about, here is the story. The Federal Communications Commission let it be known that they might look favorably on a request for a Special Temporary Authorization for Radio Amateur experimentation in spread spectrum techniques. Spread spectrum is a class of modulation systems which use bandwidths far in excess of what is needed to simply convey the intelligence... on the order of 10 to 100 times. The neat thing is that the total energy transmitted is spread throughout that band and is thus only a small fraction in any one hertz or kilohertz, maybe below the noise level. The SS receiver at the other end is synchronized with the transmitter and adds up all the pieces constructively. If you do it right, you can even get some gain and lots of privacy and immunity from interference while not bothering other users. Back to the meeting. WB3KDU agreed to act as secretary for the SS special interest group (SIG). WA3ZXW and WB3KDU are interested in modifying a pair of CB transceivers to 10 meters and developing a frequency hopping scheme. KAØESA and W4RI are interested in working with WD9EYB on a direct sequence system for the 420 MHz band. If you are interested in joining this group of SS pioneers, please get in touch with Hal Feinstein, WB3KDU, 1310 Court House Rd N, Arlington, VA 22201, 703-524-9116.

THE ARRL RADIO FREQUENCY INTERFERENCE TASK GROUP has sprung to life again after lying fallow for a few seasons. This came about as a result of Vic Clark, W4KFC's Long Range Planning Committee. The LRPC received a considerable amount of mail from amateurs complaining that they were experiencing RFI problems of one sort or another. Thus, it became clear to one and all that the problem hadn't gone away. W3ABC, W4CIZ, W2GHK, W4KFC, N4XX, W4RI and W1UED met on August 27 to discuss where to go from here. Hugh Turnbull, W3ABC will chair the new RFI Task Group. AMRAD is being looked to to supply information RFI to/from computers. If you have some input, please contact Paul Rinaldo, W4RI, 703-356-8918.

ARRL'S WASHINGTON COORDINATOR, Perry Williams, W1UED and W4RI had several productive discussions about a number of wide ranging subjects. Topics covered included spread spectrum, amateur computer/amateur radio/deaf TTY networking, a CBBS or mail box system for ARRL headquarters, new codes beyond ASCII, and better ways of circulating experimental information. There will be more discussions.

JOHN DILKS, K2TQN was upset with your humble editor for completely failing to mention his Personal Computing 80 show August 21-24. *Mea culpa!* And John an AMRAD member. John said that he would forgive us if we mentioned that (unlike Jim Warren who runs the West Coast Computer Faires and has open shoe roller skates exposing dirty socks) John is the one wearing clean socks under his roller skates. There, John; perhaps a bit undignified, but at least that's put right. Anyway, PC80 was great, and we look forward to PC81.

Sol Libes, editor of *S-100 Microsystems* said that he sold the magazine to *Creative Computing* which will continue to publish the magazine with Sol as editor.

Heathkit mentioned that in January they will have a H19-2 conversion kit to make an H19 into an H89; no price yet but may be about $650. They also have the source code for the H19 for sale for $25. W.E. Petzke at Heath is looking for some software engineers.

The Deaf and the TTY

Barry Strassler
Executive Director
Telecommunications for the Deaf, Inc.
814 Thayer Ave
Silver Spring, MD 20910
TTY 301-589-3006

Note: The telecommunications for the Deaf, Inc. (TDI), based in Silver Spring, Maryland, is the nation's second largest deaf consumer organization with 8,000 members. This organization oversees all matters that relate to telecommunications, be it legislation, product evaluation, publishing of listed TTY numbers, computer communications, etc. This article, "The Deaf and the TTY," will be published monthly in this publication, and it is the hope that AMRAD members and friends will develop an insight into the "peculiar" world of deaf telecommunications. The TDI and AMRAD have shared mutual interests in areas such as computer communications, and ASCII-Baudot interfacing.

WHY DID WEITBRECHT CHOOSE BAUDOT?

Robert Weitbrecht is a deaf physicist residing in the San Francisco Bay area. For a long time, since World War II days, he dabbled in the Morse code teletypewriting as a hobby. His proficiency in this field has earned him recognition among colleagues.

Then early in 1964, Weitbrech was strongly urged by deaf acquaintances to develop some sort of telephone communications device for the deaf. He then accepted this challenge. At that time, surplus machines and parts for the Baudot code were plentiful and cheap. These could be had for the asking by telephone companies and communications carriers across the nation. On the other hand, the data transmission concept was still in its infancy. The necessary ASCII equipment was scarce and expensive.

Weitbrecht knew that ASCII would be the code of the future while slowly supplanting Baudot. At best, Baudot would be a short-term expedient while the future would belong to ASCII. But being deaf himself, with education in schools of the deaf and deaf friends numbering his social contacts, he was doing what would be easier for his people to cope with. Many deaf breadwinners are low income earners and purchasing an extremely expensive ASCII equipment would be a considerable budgetary strain on them. In contrast, purchase of an entire Baudot equipment amounted to no more than $300.

There also was another factor - the Baudot devices were in half duplex and facilitated the simplicity of 2-way communications. The ASCII, with its full/half duplex and originate/answer maneuverings would be too complicated for the average TTY user to cope with.

With these rationales behind him, Weitbrecht selected Baudot as the code for his first TTY modem prototype. The communications engineers honored him by christening this modem, the Weitbrecht modem.

For the deaf today, Weitbrecht's selection is a blessing or a curse depending on how one looks at it.

AMRAD Newsletter

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CORRESPONDENCE

Dear Paul,

Thanks for the nice letter about AMRAD and responding so fast ref my subscription.

You probably know all about Micronet, but MACC provides us a free club usage with the use of INFOPLEX. We intercommunicate thru the MACC clubs for free with Compuserve Micronet footing the tariff on INFOPLEX. We have had it here in CCC club for over a year and Micronet has had it available since early in fall of 1978 to MACC clubs. They seem to feel that Micronet is given enough boost by us club members etc. to make it worth the free use of INFOPLEX to MACC worthwhile to charge off as a business expense to them. Micronet headquarters is located in Columbus, Ohio. Their help has been tremendous to the MACC organization of clubs.

MACC convention was a financial success this year, as contrasted with a successful convention in Louisville last year but a financial loss to the MACC organization. We will have next year's convention at Columbus also with Franklin University again providing facilities at practically no cost to MACC. MACC encompasses Toronto, Pittsburgh, Cleveland, Dayton, Detroit, Charleston, Indianapolis (SSG), Cincinnati CCC, Dayton DMA, Columbus ACASCO, Akron and several other clubs making a total of participating members 15 clubs in the Midwest area. There are no dues paid by individual clubs; we hold conventions and raise money and have a central clearing house for club papers. The club is expected to send a trustee to MACC meetings about 3 times a year or is automatically dropped.

If AMRAD is interested in joining us I will personally see to it that your application is acted on by the Trustees and would be very interested in AMRAD participation ref the deaf program at the next MACC convention sometime in June 1981.

As to repeaters for the deaf/...there been any application to use of GMRS Class A UHF in that area for local repeater? I presently am licensed and have a 20 watt Comco UHF repeater on GMRS. We have an RTTY repeater already on the air here with 60 mile coverage which with proper coordination could be used for Baudot relay for deaf possibly.

73, Ed Zibulka, W8AWK

Ed. Note: Lots edited out to fit space.

Protocol

David W. Borden, K8MMO
Rt 2, Box 233B
Sterling, VA 22170
703-450-5284 (Metro No.)

THE CHRONICLES OF 21 DATA AND NOISE

Once again shifting tones are heard on the repeater. To review for any newcomers to the data scene, the AMRAD repeater, 147.81 (input) and 147.21 (output) was founded as a shared data and voice repeater back in the days when data was RTTY (radio-teletype) and that implied that we were placing our Teletype Corp. Model 15/19 or 28KSR/ASR equipment on the radio using AFSK generators for sending and teletypewriter demodulators for receiving. The AFSK generator/demod was really what we call today a "modem" (modulator/demodulator) and think of as one unit instead of two. This RTTY activity reached its peak (as I remember anyway) about mid 1976. Then a strange thing happened. Most of us then were running autostart. That meant that you just came up on the channel, identified in Morse (mainly so anyone listening who wanted to complain to the FCC could tell who you were) and commenced sending RTTY to your buddy whose equipment detected the tones and turned on to print your message. We had an agreement then with the voice types that no autopatch activity would take place after 7 p.m. and that RTTY would have precedence (whatever that meant) until 6 a.m. The strange thing that happened was that RTTY started to go away as computers came in.

Why did RTTY disappear? Mainly (most of us will state) because our computers liked ASCII code and the FCC wanted Baudot code. In order to make the FCC happy and to retain our licenses, we would use our computers to generate Baudot code and convert it back to ASCII using all sorts of complicated methods to get the extra characters. Dave Mills (W3HCF) was the leader in this sort of activity. He worked out a conversion so that all ASCII characters could be transmitted using an extra case he called Figs-Figs. He taught his LSI-11 home computer to send and receive this case and prodded some of us into trying it with him. Keith Peterson, W8SDZ and the HF 20-meter gang had their own Baudot conversion for their Heathkit H-8's and used it to transfer programs. But, generally we all discovered that we could have our computer data fun on the phone line using Ma Bell type 103 modems and the heck with Baudot. Ward Christensen in Chicago wrote this nifty transfer program (discussed in this column in February 1980) which we used on the phone lines to send programs to each other. The repeater was often used to service the data activity on the phone line! Instead of breaking the 103 connection on the phone line, we would service the channel on the repeater, telling our buddy what the next program being sent was to be.

Then, partly through the efforts of the local AMRAD gang, the FCC approved ASCII for radio use by amateurs. Wow! Now we can really do our thing, right? Wrong. Everyone fired up their 103 modems on the repeater on ASCII Day One using WB4APR answer-half originate connection, sent greetings to each other all night and quit. I had to work that night, so I got on the next day and a half until I got my modem on frequency and talked to the gang. This went on for about 4 days and then nothing. Data died again. Why? We claim that it was because our 103 modems (by cruel Vadic design) cannot handle more than probably 600 baud. Also because the answer-half originate modem idea was too non-standard to work.

About this time, the Ma Bell type 202 modems started showing up at hamfests. Terry (WB4JFI) and Bob (WB4APR) bought them up cheaply and carted them home to sell to the rest of us. This modem looks like the right answer if we can make it fly. It uses two tones and half-duplex in similar fashion to the old RTTY demodulators. The two tones are spread far enough to allow 1200 baud data communications (1200 Hz mark and 2200 Hz space). They mostly have a full duplex mode (four-wire they call it) which makes it a snap to connect to your two-meter rig (two wires to the speaker, two wires to the mike thru a capacitor/level pot). Thus, you really run half duplex on the repeater just like usual, but you really have a full duplex modem connection. If you used a separate radio receiver on 432 MHz for example, you could run full duplex. So, Terry, Bob and I commenced to experiment on the AMRAD repeater with these new modems. Maybe we can revive data on the machine again. But, I discovered a new problem at once -- noise.

Noise is an over-generalized term which I use to mean anything on the data channel that I am not interested in. In the case of the repeater, it is voice, autopatch, repeater ID and intermodulation garbage that shows up on the machine. All the previously mentioned noise items cause the carrier detect light on the 202 modem to light

(it found 1200 Hz) and my computer program to respond by accepting the junk and doing whatever is commanded with it (put up on station ASCII terminal, stuff in file, etc.). I wanted autostart, actually automatic station. Until the computer could reject all the channel noise, autostation is not possible. I started to look at the way I obtained characters from the modem and worked on them. I use a USART connected to the modem to get my characters and deliver them to the computer in parallel fashion. What is a USART?

Early on in RTTY activity, when we were using our computers to emulate Teletype Corp. Model 28 equipment, we discovered the UART (Universal Asynchronous Receiver Transmitter). This little integrated circuit chip did everything for us in serial-parallel-serial conversion that we could desire. It was inexpensive and worked well without complicated feeding techniques. Today, some use an upgraded version of the UART, called the USART (Universal Synchronous Asynchronous Receiver Transmitter). A number of us use the Intel 8251 USART. It once sold at Radio Shack for $8.00 until they stopped selling neat chips. It is still very obtainable locally in that price range. The USART requires more careful feeding to function properly, however. It must be set up in software and then polled (unless you like interrupts) correctly. Like the UART, it pays attention to framing and parity and overrun. Thus begins our discussion of how to tell a proper ASCII character from noise on the repeater.

First some definitions:

Framing - The process of selecting the bit groupings representing one or more characters from a continuous stream of bits.

Parity - Equivalence of value in the check digit appended to an array of bits to make the sum of all the bits always odd or always even.

Overrun - A condition where the total activity taking place on the data channel exceeds the capability of that channel to handle it.

On with the story. I was using the USART to obtain characters from the modem by software poll of the USART status port. But, I accepted anything as a good character. I had to change the software poll to check on the character parity (accept only even parity for example), framing (did I slip a bit?) and overrun (did I lose a character while off playing in software?). Doing this allowed the software to reject a bunch of garbage. Now letting the system run 24 hours daily on the repeater, I reject three fourths of the junk as junk and only one fourth of the junk gets by as good parity, good framing and non-overrun. That, coupled with a better hardware carrier detect circuit (demand carrier detect for 2 seconds constantly or do not receive) should allow autostation. The following is a TDL Assembler Z-80 example of how I handle the USART:

```
; MODSTA SUBROUTINE
; CHECKS MODEM FOR GOOD CHARACTER STATUS
; IF ONE FOUND WITH GOOD PARITY
;                   GOOD FRAMING
;               AND GOOD NON-OVERRUN
; TAKE IT.  A GOOD CHARACTER WILL HAVE ONLY
; ONE STATUS BIT SET, THE RECEIVE CHAR READY
; ERROR BITS WILL BE ZERO
; MCTLP IS THE MODEM STATUS PORT
;
MODSTA: IN      MCTLP   ;GRAB STATUS WORD
        ANI     3AH     ;MASK FOR PARITY/
                         FRAME/OVERRUN
;HERE CHECK ALL ERROR CONDITIONS
;BIT 1 TRUE=CHARACTER READY
;BIT 3 TRUE=PARITY ERROR
;BIT 4 TRUE=OVERRUN ERROR
;BIT 5 TRUE=FRAMING ERROR
;
        CPI     012H    ;OVERRUN ERROR
        CZ      ERRST   ;GO RESET
        CPI     022H    ;FRAMING ERROR
        CZ      ERRST   ;GO RESET
        CPI     032H    ;FRAMING/OVERRUN ERRORS
        CZ      ERRST   ;GO RESET
        CPI     01AH    ;OVERRUN/PARITY ERRORS
        CZ      ERRST   ;GO RESET
        CPI     02AH    ;FRAMING/PARITY ERRORS
        CZ      ERRST   ;GO RESET
        CPI     03AH    ;OVERRUN/FRAMING/
                         PARITY ERRORS
        CZ      ERRST   ;GO RESET
;
; HERE ALL BITS CLEAR EXCEPT BIT 1, GOOD CHAR
        CPI     02H     ;02H=READY,00=NO
        RNZ             ;IF NOT OK
        RET             ;IF OK
;
; ERRST SUBROUTINE
; ERROR RESET OF USART UPON ERROR DETECTION
; CLEAR OUT ERROR BITS FOR NEXT TIME
;
ERRST:  MVI     A,017H  ;ER,RXE,DTR,TXEN
        OUT     MCTLP
        RET
```

Note that this code is not short, quick and direct, but rather was written specifically to illustrate the checking of the error bits. Normally you would make one comparison for 02- character ready with no error bits set. If 02 was not found, you know either that a character is not ready, or that one is ready with an error. In either case you can safely reset the error flags and go look again until 02 is found.

To end this story, I now have a program to handle the USART error conditions and can move on to the hardware changes required for autostation. I must have a 2 - 5 second carrier detect circuit and a transmitter on by computer circuit (one relay) and lots more software. Then we can begin transmitting programs over the repeater, play with teleconferencing (subject of another article) and toy with packets. The Canadian Connection, previously mentioned in

this column, currently requires 1200 baud Bell 202 modems on 2 meters. If you want to play with autostation ideas, find a surplus 202 modem and get it up on the repeater. You could also modify your old RTTY demodulator and AFSK generator to 1200/2200 Hz tones if you want. It is easier to find a 202 surplus (and a good deal cheaper - unless you still have the RTTY equipment). 73 'til next column...Dave/K8MMO.

AMRAD Newsletter

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CORRESPONDENCE:

Have APPLESOFT/Bearcat 210, 220. How do I get them together?

Glenn K Johnson
SR3 Box 30188
Fairbanks, AK 99701

Ed Note: If you can answer Glenn, please send a copy to the AMRAD Newsletter.

Dear OM/YL,

I was most interested to hear about your organisation in the "Bytelines" column in the July 1980 issue of *Byte*.

As a member of the IC^2 (InterComputer Communications) group of "Aurora Computer Society" I would be grateful if you would send me more information about AMRAD.

73, de Paul Wilson (ZL2TOI/VE6)

Ed Note: We subsequently agreed with Terry Wilcox, VE6BEZ to exchange newsletters with the Aurora Computer Society. We received a copy of theirs known as INTERCOM 80.

Paul,

Over the weekend, I built up the Suding 1200 baud modem & ran into two small but important mistakes:

1. R34 should be 100k not 10k.
2. Diodes S7 and S8 should be reversed (i.e., reverse direction of each).

The modem worked fine using the 1800/2500 Hz shifts.

I also tried it on the standard 1200/2200 Hz shift & after a little tweaking got it to work.

If you plan to use the 1200/2200 shift, I would recommended using the 1741SCPI instead of the standard 741. The 1741SCPI has a twenty-times higher slew rate than the standard 741. Only problem is the 1741SCPI is hard to find. I did find them for $1.75 each at Diplomat Electronics in Columbia, MD. I bought them thru my company. I'm not sure if they will sell to an individual.

Anyway hope this will help out any future builders of the modem.

Tedd Riggs, KA4FYU

Dear Sirs,

I learned of your organization at the Personal Computing 80 show in Philadelphia. Apparently you had a newsletter up there but I missed out and did not get a copy. The ARRL booth gave me the address from their copy. I am very much interested in applications of computers to Amateur Radio. I am the builder and trustee of WR4AFT repeater in Hampton, VA and am currently teaching Microcomputer Design courses in Hampton, VA at the local technical school. I have the following equipment: Z-80 computers with 8 & 5 inch floppies running CP/M with several high level languages - Microsoft BASIC, FORTRAN, UCSD PASCAL, C, PL/I.

I am interested in setting up a CBBS system possibly with a 2 meter repeater. I am also interested in contacting people into these type activities for mutually rewarding discussions perhaps.

Sincerely
Dave Holmes, K4UMI
PO Box 1708
Grafton, VA 23692

Paul:

Thanks for the AMRAD newsletter. I'll make a note in my column about your newsletter, and bring some copies to the Sept 22 meeting.

I'll look forward to seeing future issues. I've got a TRS-80 w/16k and am now saving for a modem. Also working on getting my Mod 15 TTY interfaced to it.

We have a 10/70 rptr with a computerized mail box system and message storage from the NWS weather wire, so we can query the system for WX info anytime. Talk of a 450 ASCII rptr has been heard around Dallas, but I haven't been able to locate the source yet.

Best of luck to AMRAD and 73.

Rich WA9LRI/5

Dear Mr Rinaldo

As an amateur radio operator I am intrigued by what I hear hams discussing regarding computers over the air. It is somewhat difficult to glean ample information from magazines as to plan a station to utilize a computer to its fullest capability. Here are some thoughts and desires. I have and would appreciate your output concerning them.

AIM - To set up a multi-mode computer assisted amateur radio station, utilizing--

-Computer for I/O of CW, Baudot and ASCII.

-Utilizing computer for standby on frequencies where 24 hour I/O MARSGRAMS may be come by as conditions dictate. Automatically ans.

-Utilizing computer control of frequency I/O as necessary for best atmospheric radiotelecommunications. Tuning antenna tuner for maximum signal strength...

-Keeping log, with detailed findings from communications, i.e., copies of messages I/O other items of log information.

This year the Microlog computer is planned and the item next year will be a printer that prints 20 point... I am visually handicapped.

Robert E. Warren KA1AWK
RFD 7, 2 Spring Rd
Augusta, ME 04330

Ed Note: Any ideas?

Liquid Crystal Displays

Reprinted courtesy
Grayhill, Inc.
561 Hillgrove Ave
La Grange, IL 60525

Low cost, low power consumption, and size flexibility have resulted in increased use of the liquid crystal display (LCD). Unlike light emitting diodes or incandescent displays, liquid crystal displays do not emit or generate light. Instead, the liquid crystal display alters externally generated illumination. Therefore, liquid crystal displays require either the presence of ambient light or a light source to provide illumination.

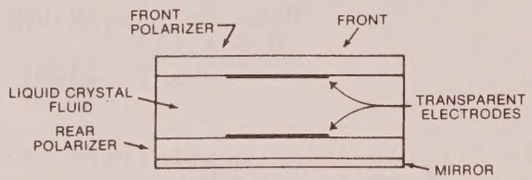

FIGURE 1

Fig. 1 shows the basic construction of the field effect type liquid crystal display. The field effect LCD consists of a liquid crystal fluid sandwiched between front and rear transparent polarizer material. Transparent conductive films form electrodes in the shape of the desired display pattern. The front and rear polarizers are arranged so the light polarization angle is 90 degrees with respect to one another.

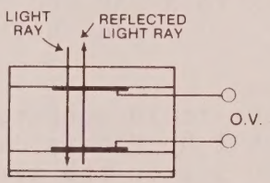

FIGURE 2

As shown in Fig. 2, when the electrical excitation between the transparent electrodes is zero, the light coming through the front polarizer is rotated 90 degrees as it passes through the liquid crystal fluid. Once rotated the light will pass through the rear polarizer where the light is reflected by the mirror. The reflected light ray returns as shown and the liquid crystal material appears transparent.

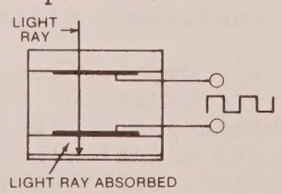

FIGURE 3

As shown in Fig. 3, when an excitation voltage is applied to the electrodes, the molecules in the liquid crystal fluid rotate such that the light is no longer rotated 90 degrees through it. The light is therefore absorbed by the rear polarizer, causing the appearance of a dark area in the shape of the electrodes.

Another type of liquid crystal display, the dynamic scattering LCD, operates in a slightly different manner. Without an excitation voltage the background appears dark in this type of display. When a voltage is applied to the electrodes, ion activity in the liquid crystal material causes turbulence resulting in a scattering of the external light. This produces the effect of a lighted image in the shape of the electrode on a dark background.

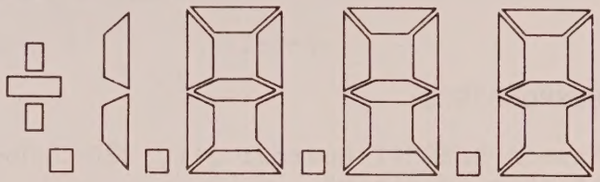

FIGURE 4

The conductive film forming the electrodes can be arranged in a variety of patterns. Fig. 4 shows a typical configuration that might be employed with 3 1/2 digit voltmeter display. The front electrodes are shaped in the form of the digit segments as shown. A single electrode, commonly referred to as the back plane, extends across the rear of the entire display. The excitation voltage is applied between the back plane and the desired segments in the display.

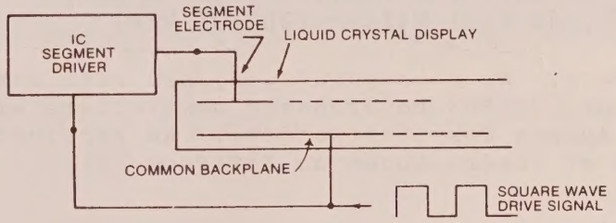

FIGURE 5

Fig. 5 shows the basic circuit arrangement used to drive a liquid crystal display. An integrated circuit segment driver, which provides the necessary decoding and latching circuitry, is connected to the common back plane and to the individual segment electrodes. Only one electrode connection is shown in Fig. 5. A square wave drive signal is applied to the segment driver as well as the common back plane. The logic circuitry within the IC segment driver controls the phase of the square wave voltage to properly excite the display.

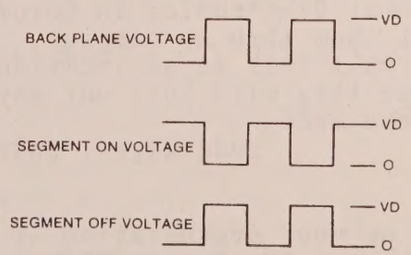

FIGURE 6

Fig. 6 shows the 'on-off' phase relationship of the segment excitation voltage and back plane voltage. When the segment voltage is 180 degrees out of phase with the back plane voltage, that particular segment is activated. If the segment voltage is in phase with the backplane voltage that segment is deactivated.

The power requirements of liquid crystal displays are quite small in comparison to incandescent or LED types. The typical drive current for a liquid crystal display is in the 3 to 5 microamp range. The square wave drive signal used to activate the display is usually in the range of 2.6 to 12 volts, typically 5 volts. The operating frequency of the display drive signal is 25 to 100 hertz. The characteristics of the liquid crystal material do not permit the application of a direct or non-pulsed dc excitation voltage. A dc voltage would damage the display. Liquid crystal display lifetime is normally in the range of 50,000 hours.

In addition to conventional digital displays like Fig. 4, LCD's have been developed with graphics capability. The display is arranged as a matrix of individual points which can be turned on or off. With an adequate density, many of the capabilities of a CRT display can be achieved.

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CYBERTEK'S ASCII POCKET TERMINAL was on display at PC80. It's about the size of a pocket calculator (but a little thicker), has a built in Bell 103 modem, 80-character memory, all for $379. Write: Cybertek, PO Box 7500, Menlo Park, CA 94025; phone 408-263-4379.

SATELLITE is a program for tracing spacecraft in circular or elliptical orbits, using an Apple II (or II+) and 32k of RAM. Requires Applesoft. Al Jensen, WA7TIB 19111 First Ave NW, Seattle, WA 98177.

SMITH COMPUTER SYSTEMS, 530 Pierce Ave, Dyer, IN 46311 is offering an amateur radio RTTY program using CP/M, available on 5 or 8 inch diskettes. Uses either ASCII or Baudot. $39.95; $69.95 with source.

MORSECOPY, MORSEFILE & HAMCALL are three programs for $29.95, $19.95 and $49.95 respectively for the TRS-80. Contact The Periferal People, PO Box 524, Mercer Island, WA 98040; 206-232-4505.

NETWORKING: Design and Implementation of Computer Communication Networks, a Practical Approach, is a seminar running December 2-4 at the Ramada Inn, Lanham, MD. Registration fee is $595. Write Digital Equipment Corp., Seminar Programs, 29 Hudson Rd, Sudbury, MA 01776; 617-493-2858.

DATA COMMUNICATIONS: a short course is being offered at the National Airport Holiday Inn, Arlington, VA November 5-7. The course fee is $545. Write American Institute for Professional Education, Carnegie Bldg, Hillcrest Rd, Madison, NJ 07940; phone 201-377-7400.

TWO SPREAD SPECTRUM SHORT COURSES are being given at George Washington University. Synchronization in Spread Spectrum Systems is scheduled for December 8-10; fee $535. Vulnerability of Spread Spectrum Communication Systems will be December 15-17; fee also $535. Write GWU, Continuing Engineering Education Program, Washington, DC 20052; 202-676-6106, 800-424-9773, TELEX 64374 int'l.

VIDEO EXPO will be at New York's Madison Square Garden, October 21-23. Admission is $5 at the door. Mailing address is Knowledge Industry Publications, Inc., 2 Corporate Park Dr, White Plains, NY 10604. The company also has a catalog of video books.

EVEN IF YOU ARE ONLY SLIGHTLY VULNERABLE to being talked into being our new ad manager, please contact Paul Rinaldo, W4RI on 703-356-8918 days or evenings.

AMRAD **Amateur Radio Research and Development Corporation**

Membership Application/Renewal

Mail to: Gerald Adkins, Treasurer
1206 Livingston St N
Arlington, VA 22205

Dues:		Annual	Life
	Regular	$12	$120
	2nd in family	6	60
	Full-time student	3	-

Please make checks payable to AMRAD.

Name_____

Ham Call_____ Home Phone( )_____

Class License_____ ☐ ARRL Member

Have: ☐ 2-meter FM ☐ RTTY
☐ Computer model_____
Microprocessor type_____

Address_____

City,
State_____ ZIP_____

I agree to support the purposes of the Corporation.

*Signature*_____

THE AMATEUR RADIO RESEARCH AND DEVELOPMENT CORPORATION is a technically oriented club of about 300 radio and computer amateurs. It is incorporated in the Commonwealth of Virginia and is recognized by the Internal Revenue Service as a tax-exempt scientific and educational organization.

THE PURPOSES OF THE CLUB are to: develop skills and knowledge in radio and electronic technology; advocate design of experimental equipment and techniques; promote basic and applied research; organize forums and technical symposiums; collect and disseminate technical information; and, provide experimental repeaters.

MEETINGS ARE ON 1st MONDAY of each month at 7:30 p.m. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA. If the 1st Monday is a holiday, an alternate date will be announced in the *AMRAD Newsletter*. Except for the annual meeting in December, meetings are normally reserved for technical talks - not business.

THE WD4IWG/R REPEATER is an open repeater for data communications (including RTTY), voice and experimental modes. It is located at Tyson's Corner, McLean, VA and has excellent coverage. It features a semi-private autopatch available to licensed members. Frequencies are: 147.81 MHz input, 147.21 MHz output. The head of the technical committee is Jeff Brennan, WB4WLW, 7817 Bristow Dr, Annandale, VA 22003, phone 703-354-8541.

THE AMRAD NEWSLETTER is mailed monthly to all members and to other clubs on an exchange basis. Technical articles, new product announcements, news items, calls for papers and other copy related to amateur radio and computing are welcome. Honorariums at a rate of $10 per printed page ($20 maximum per author per issue) are paid for original material accepted. Classified ads are free to members. Commercial ad inquiries are invited. The editor reserves the right to reject or edit any portions of the copy. Items should be mailed by the 8th of the preceeding month to Paul L. Rinaldo, W4RI, Editor, 1524 Springvale Ave, McLean, VA 22101; phone 703-356-8918. Full permission for reprinting or quoting items appearing in the *AMRAD Newsletter* is granted provided that credit is given. Mailing is by 3rd Class bulk mail to U.S. addresses and 1st Class to Canada and Mexico. Overseas readers add 60¢ for surface or $5.64 for air mail to annual dues.

THE AMRAD MESSAGE SYSTEM is an S-100 Computerized Bulletin Board System on 703-734-1387, system operator Terry Fox, WB4JFI. Terry's home phone number is 703-356-8334. The system accepts 110, 300, 450 and 600 baud ASCII callers using Bell 103-compatible modems.

THE HANDICAPPED EDUCATION EXCHANGE (HEX) is operated by AMRAD for those involved in education and communications for the handicapped. It accepts both 110/300-baud ASCII and deaf TTY callers. on 301-593-7033. The sysop Dick Barth, W3HWN's home phone is 301-681-7372.

AMRAD OFFICERS for 1980 are:

Gerald Adkins, N4GA	Treasurer
Jeffrey Brennan, WB4WLW	Director Repeater Trustee
Tedd Riggs, KA4FYU	Librarian
Robert E. Bruninga, WB4APR	Director VP-Asia
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William Pala, Jr., WB4NFB	Director Secretary
Paul L. Rinaldo, W4RI	Director President
Elton A. Sanders, Jr., WB5MMB	2nd Alt.

THE AMRAD LIBRARY is operated by Tedd Riggs, KA4FYU, 8402 Berea Ct, Vienna, VA 22180, phone 703-573-5067. Donations of technical books, magazines, manuals and catalogs are tax-deductible.

AMRAD IS AFFILIATED with the American Radio Relay League (ARRL), the Foundation for Amateur Radio, the Northern Virginia Radio Council (NOVARC) and The Mid Atlantic Repeater Council (T-MARC).

SPECIAL INTEREST GROUPS are formed from time to time. Currently we have SIG's on Deaf Communications and Spread Spectrum Communications. If you are interested in joining or forming a SIG, please contact Bill Pala, WB4NFB, 5829 Parakeet Dr, Burke, VA 22015; phone 703-323-8345.

TRAINING CLASSES are run as needed. Please discuss your training requirements with any Director.

AMATEUR RADIO RESEARCH AND
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